A Breeding Aggregation of *Chauliognathus pulchellus* Macleay (Coleoptera: Cantharidae)

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Introduction

Chaulignathus pulchellus Macleay is a medium sized, aposematic cantharid beetle common in south-eastern Australia, particularly in montane areas (Britton 1970, Moore and Brown 1978). Adults are active during summer and are commonly attracted to blossom in large numbers, where they feed on nectar and pollen (Brooks 1948, Hawkeswood 1978, 1981, Moore and Brown 1978, Webb 1985, 1986). Swarming of *C. pulchellus* has rarely been reported in the literature (Froggatt 1907: 168, McKeown 1942: 129, Zeck 1919) though this phenomenon is apparently quite common (D. I. Bevege pers comm., R. H. Eldridge pers. comm., B. P. Moore pers. comm.) Hadlington and Johnstone (1982) reported swarming in cantharid beetles but did not indicate which species.

Moore and Brown (1978) suggest that *C. pulchellus* adults are primarily diurnal and often roost overnight in dense aggregations on grass stems and other low vantages beneath their blossom food source. Zeck (1919) earlier reported an aggregation of *C. pulchellus* on the ground but did not indicate at what time of day the aggregation was observed nor whether a suitable food source was available.

In January 1985, an aggregation of *C. pulchellus* was observed in tall open eucalypt forest in the Coolangubra State Forest (37°01'S 149°23'E) near Bombala, New South Wales. Observations on density, roost specificity, behaviour and possible food sources are presented.

Observations

Vegetation

The tall open forest was dominated by *Eucalyptus viminalis* Labill., *Eucalyptus radiata* Sieb. ex DC. and *Eucalyptus ovata* Labill. with *Banksia marginata* Cav., *Acacia melanoxylon* R. Br., *Acacia dealbata* Link and *Lomatia myricoides* (Gaertn. f.) Domin as major understorey shrubs. Ground vegetation included *Lomandra longifolia* Labill., *Gahnia sieberiana* Kunth and *Poa* sp. At the time of observation three tree species *E. radiata, E. viminalis* and *Eucalyptus fastigata* Dean and Maiden were flowering in the Coolangubra S.F. (R. P. Kavanagh, pers. comm.) Fifty percent of *E. radiata,* the dominant species in the immediate study, were flowering as were smaller proportions of *E. viminalis* and *E. fastigata.* No understorey or ground layer plants were flowering at that time.

Aggregation

The aggregation was first observed at 12 noon on 18 January, 1985. Individuals and copulating of *C. pulchellus* were found crawling over the foliage of *L. longifolia* or tightly packed in the bases of *L. longifolia* clumps. Many individuals were in flight. A few individuals and pairs were also found on the foliage and stems of other plant species (*G. sieberiana, L. myricoides* and *Eucalyptus* saplings). The boundary of the aggregation was marked out with red tape for future reference. The aggregation covered ca. 117 m^2 in area. All *L. longifolia* clumps within the marked area had at least one *C. pulchellus* adult on them.

On 18 January, the aggregation was conservatively estimated at 10 000 individuals. On subsequent visits (10 a.m. — 21 January, 9 a.m. — 23 January, 5p.m. — 26 January, 5 p.m. — 28 January) numbers were sequentially reduced. On 26 January, the number of *C. pulchellus* remaining were counted and the distribution and abundance in and around the marked area of the original observation was noted (Fig. 1). 227 individuals were still

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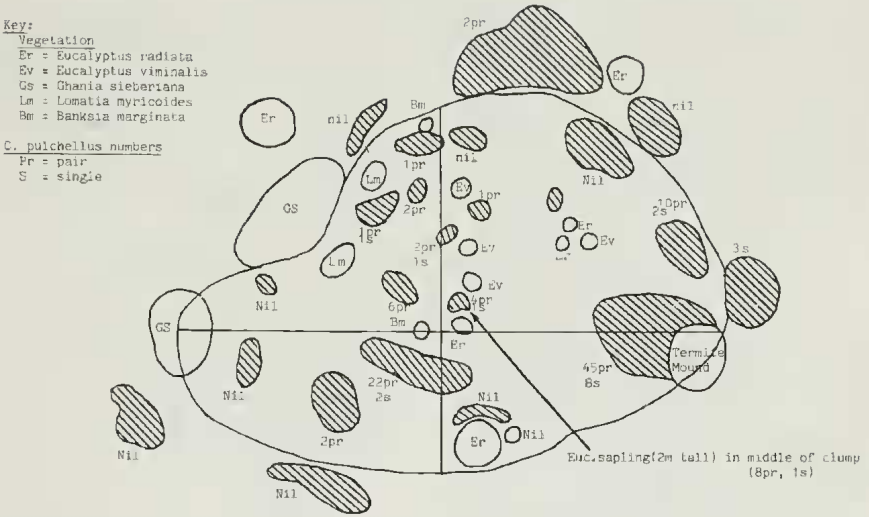

Fig. 1: Distribution and abundance of *Chauliognathus pulchellus* Macleay on *Lomandra longifolia* Labill. in relation to surrounding vegetation. *L. longifolia* clumps are shown as cross hatched areas with the number of *C. pulchellus* shown beside them.

present, 92% of which were paired up in copulation (i.e. with the male riding on the female's back). Apart from 17 individuals (8 pairs and a lone individual) (7%) found on a *Eucalyptus* sapling growing up through a *L. longifolia* clump, all *C. pulchellus* were found on *L. longifolia*. Many *L. longifolia* clumps were vacant at that stage. The largest number (98) of *C. pulchellus* was found on the largest clump but size did not necessarily correlate with numbers of *C. pulchellus* present. By 28 January, less than 10 individuals remained in the marked area.

On 26 January, adjoining areas within the forest were examined for *C. pulchellus*. Apart from scattered individuals or copulating pairs, no *C. pulchellus* were found even in areas of extensive *L. longifolia* cover.

Behaviour

When disturbed, *C. pulchellus* quickly moved to the underside of the *L. longifolia* leaf and subsequently dropped to the ground burying themselves beneath leaf litter in and around the *L. longifolia* clumps. Copulating pairs usually separated when disturbed. When searched out, individuals were usually found several centimetres below the litter surface close to the soil layer.

On several occasions, females were observed presumably attempting to remove males from their backs by grasping their perch with the anterior two pairs of legs and shaking the abdomen vigorously. On no occasion was this seen to work.

Discussion

Zeck (1919) reported swarming in *C. pulchellus* but suggested no reason for the aggregation. The aggregation observed here was presumably for the purpose of breeding since 92% of animals in the aggregation were paired and in copulation however it is unclear what mechanism(s) was reponsible for the aggregation. Considering the near 1:1 male-female ratio in the aggregation, attraction could not have resulted from a sex-specific pheremone since they tend to attract only

large numbers of the targeted sex. General pheremones may also illicite aggregation in some beetles (Chapman 1969). Males of the lycid, *Lycas loripes* emit a pheremone which attracts both sexes to an abundant food source (blossoms). Mating occurs in these aggregations. *C. pulchellus* may occur in dense aggregations on blossoms (Bevege pers. comm., Eldridge pers. comm., Froggatt 1907, Moore pers. comm., Moore and Brown 1978) during which mating occurs suggesting that *C. pulchellus* (one or both sexes) may also emit a pheremone which attracts other individuals to blossom. Alternately, *C. pulchellus* individuals may be attracted, over a short range, by the general body odour of conspecifics (Moore pers. comm.)

Unfortunately, while a large proportion of eucalypts in the area were flowering during January 1985 (Kavanagh pers. comm.) no observations of overstorey flowering in the immediate study area nor of the presence of *C. pulchellus* on the blossoms were made. If blossom was the original stimulus for aggregation the presence of large numbers of *C. pulchellus* on the ground may be attributed to the fact that most were paired up and in copulation. Conceivably females were unable to fly while carrying males. However, the fact that most *C. pulchellus* were perched on *L. longifolia* in the presence of other suitable perches suggests that *L. longifolia* may be important for other reasons than food. A clue to this obvious attraction to *L. longifolia* may be found in the fact that other insects, particularly flies (see Moorehouse and Colbo 1973 for review), use certain plants as markers for aggregation and breeding. The heavily littered bases of *L. longifolia* clumps may be ideal oviposition sites for *C. pulchellus* and/or its larval prey (i.e. the eggs and larvae of locusts, mantids and flies) (Goode 1980, McKeown 1942, Tillyard 1926).

Chapman (1969) indicated that there may be adaptive advantages, other than maximising breeding efficiency, in aggregation. Chapman suggested that aggregations of distasteful insects with aposematic colouration may also reduce population losses through predators learning to avoid them more quickly. Cantharidin, an anti-predator substance in *Cantharis* (now a Meloid beetle), is not present in the Cantharidae. However, Moore and Brown (1978) have recently identified several alkaloids including precoccinelline, in secretions from the defensive glands of the prothorax and abdomen of *C. pulchellus* and suggest that this secretion may be an effective deterrent to vertebrate predators.

Acknowledgements

Thanks are due to Dr. B.P. Moore for his enlightening comments on some of the observations made here and to S. I. Bevege, R. H. Eldridge, R. P. Kavanagh and B. P. Moore for allowing the use of their unpublished data.

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